

Notice of Allowability

Application No.

10/064,727

Examiner

Tiffany A. Fetzner

Applicant(s)

FREEDMAN, ROBERT

Art Unit

2859

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the 2/14/2006 After-final amendment & the telephonic interview of 2/28/2006.
2. ☒ The allowed claim(s) is/are examiner amended claims 1-4, 6-24, 28, 29, and 32.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☒ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
(a) ☒ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
1) ☒ hereto or 2) ☒ to Paper No./Mail Date 2/28/2006.
(b) ☒ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date 2/28/2006.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

- | | |
|---|--|
| 1. <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 5. <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 2. <input checked="" type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 6. <input checked="" type="checkbox"/> Interview Summary (PTO-413),
Paper No./Mail Date <u>2/28/2006.</u> |
| 3. <input type="checkbox"/> Information Disclosure Statements (PTO-1449 or PTO/SB/08),
Paper No./Mail Date _____ | 7. <input checked="" type="checkbox"/> Examiner's Amendment/Comment |
| 4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit
of Biological Material | 8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance |
| | 9. <input type="checkbox"/> Other _____ |

Election of Species

1. This application contains claims directed to the following patentably distinct species:

Species 1 pending **claims 1-4, 6-24, 28, 29, and 32** drawn to a method of making formation evaluation measurements where acquired NMR measurements, and acquired dielectric permittivity measurements are combined to determine the oil volume fraction of the earth formation,

Species 2 comprising pending **claims 30 and 31** is drawn to a method of determining a gas fractional volume in a gas-liquid sample where an acquired bulk density measurement and an acquired NMR measurement are combined to determine the gas fractional volume in the gas-liquid sample.

2. These two species are independent or distinct because **Species 2** does not require any dielectric permittivity measurements to be made, as in **Species 1**, and **Species 1** does not require a liquid-gas sample as is required in **Species 2**.

3. Applicant is required under 35 U.S.C. 121 to elect a single disclosed species for prosecution on the merits to which the claims shall be restricted if no generic claim is finally held to be allowable. Currently, **no claims are generic**.

4. Applicant is advised that a reply to this requirement must include an identification of the species that is elected consonant with this requirement, and a listing of all claims readable thereon, including any claims subsequently added. An argument that a claim is allowable or that all claims are generic is considered nonresponsive unless accompanied by an election.

5. Upon the allowance of a generic claim, applicant will be entitled to consideration of claims to additional species which depend from or otherwise require all the limitations of an allowable generic claim as provided by 37 CFR 1.141. If claims are added after the election, applicant must indicate which are readable upon the elected species. MPEP § 809.02(a).

6. During a telephone conversation with Applicant's representative **Bryan L. White, Reg. No. 45,211** on **Feb. 28th 2006** a provisional election was made **without traverse** to prosecute the invention of **Species 1 claims 1-4, 6-24, 28-29, and 31**, it is noted that with this election that "Applicant reserves the right to file a divisional application or request for continued examination, as appropriate, to capture those canceled claims in a subsequent application claiming priority from the present application".

7. Affirmation of this election must be made by applicant in replying to this Office action. **Claims 30 and 31 are withdrawn from further consideration by the examiner**, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Examiner's Amendment

8. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

9. Authorization for this examiner's amendment was given in a telephone interview with Applicant's **Bryan L. White, Reg. No. 45,211** on **Feb. 28th 2006** along with

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authorization to charge any necessary fees to applicant's deposit account. No fees are believed to be necessary since applicant's after-final amendment of February 14th 2006 was filed less than two months after the December 21st 2005 final office action by the examiner.

10. The application has been amended as follows:

A) Replace claim 1 of the February 14th 2006 after-final amendment with the following Examiner amended claim 1:

Claim 1 --- A method for making formation evaluation determinations, comprising:
acquiring a nuclear magnetic resonance measurement of an earth formation;
acquiring a dielectric **permittivity** measurement of the earth formation; and
determining an oil volume fraction of the earth formation from a combination of
the nuclear magnetic resonance measurement and the dielectric **permittivity**
measurement. ---

B) Replace claim 4 of the February 14th 2006 after-final amendment with the following Examiner amended claim 4:

Claim 4 --- The method of **claim 1**, wherein the dielectric **permittivity**
measurement comprises an electromagnetic wave phase shift. ---

C) Replace claim 6 of the February 14th 2006 after-final amendment with the following Examiner amended claim 6:

Claim 6 --- The method of **claim 1**, wherein the acquiring the nuclear magnetic
resonance measurement and the acquiring the dielectric **permittivity** measurement are
performed while drilling. ---

D) Replace claim 7 of the February 14th 2006 after-final amendment with the following Examiner amended claim 7:

Claim 7 --- The method of **claim 1**, further comprising:
determining a water-filled porosity from the dielectric **permittivity** measurement;
determining a total formation porosity from the nuclear magnetic resonance measurement; and
determining an oil-filled porosity by subtracting the water-filled porosity from the total formation porosity. ---

E) Replace claim 8 of the February 14th 2006 after-final amendment with the following Examiner amended claim 8:

Claim 8 --- The method of **claim 1**, wherein the dielectric **permittivity** measurement comprises an electromagnetic wave attenuation. ---

F) Replace claim 11 of the February 14th 2006 after-final amendment with the following Examiner amended claim 11:

Claim 11 --- The method of claim 10, further comprising:
determining a total volume of the formation fluids from the nuclear magnetic resonance measurement;
determining the water volume fraction of the formation fluids from the dielectric **permittivity** measurement; and
determining the oil volume fraction of the formation fluids by subtracting the water volume fraction of the formation fluids from the total volume of the formation fluids. ---

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G) Replace claim 12 of the February 14th 2006 after-final amendment with the following Examiner amended claim 12:

Claim 12 --- The method of **claim 10**, wherein the dielectric **permittivity** measurement comprises an electromagnetic wave attenuation. ---

H) Replace claim 14 of the February 14th 2006 after-final amendment with the following Examiner amended claim 14:

Claim 14 --- A method for making formation evaluation determinations, comprising:
acquiring a nuclear magnetic resonance measurement of an earth formation;
acquiring a dielectric **permittivity** measurement of the earth formation;
acquiring a bulk density measurement of the earth formation;
forming a set of linear response equations representing a reservoir fluid model;
and
solving the set of linear response equations to determine fractional fluid volumes of the earth formation from a combination of the nuclear magnetic resonance measurement, the dielectric **permittivity** measurement, and the bulk density measurement. ---

I) Replace claim 18 of the February 14th 2006 after-final amendment with the following Examiner amended claim 18:

Claim 18 --- The method of **claim 16**, wherein the dielectric **permittivity** measurement comprises a measurement of a complex dielectric constant of the formation. ---

J) Replace claim 22 of the February 14th 2006 after-final amendment with the following Examiner amended claim 22:

Claim 22 --- The method of **claim 14**, wherein the reservoir fluid model comprises a representation of a gas-bearing formation, **where** the fractional fluid volumes comprise:

a gas volume fraction;

a water volume fraction; and

a gas-corrected total volume, and

the set of linear response equations comprises:

a nuclear magnetic resonance response equation that defines a total volume of formation fluids with respect to the gas volume fraction, a water volume fraction, and a gas-corrected total volume;

a dielectric response equation that is adapted for the gas-bearing formation by defining an electromagnetic wave travel time with respect to the gas volume fraction and a gas travel time, the water volume fraction and a water travel time, and the gas-corrected total volume and a gas-corrected travel time; and

a density response equation that is adapted for the gas-bearing formation by defining the bulk density measurement with respect to the gas volume fraction and a gas density, the water volume fraction and a water density, and the gas-corrected total volume and a gas-corrected total density. ---

K) Replace claim 28 of the February 14th 2006 after-final amendment with the following Examiner amended claim 28:

Claim 28 --- A method for making formation evaluation determinations, comprising:
acquiring a nuclear magnetic resonance measurement of an earth formation;
acquiring a dielectric **permittivity** measurement of the earth formation; and

determining a rock-matrix travel time associated with the earth formation from a combination of the nuclear magnetic resonance measurement and the dielectric **permittivity** measurement. ---

L) Cancel claims 30 and 31 of the February 14th 2006 after-final amendment, which correspond to a withdrawn non-elected species as per the examiner's telephonic interview of February 28th 2006 with applicant's representative Bryan L. White, Reg. No. 45,211.

M) Replace claim 32 of the February 14th 2006 after-final amendment with the following Examiner amended claim 28:

Claim 32 --- A method for making formation evaluation determinations, comprising:
acquiring a dielectric **permittivity** measurement of an earth formation;
determining a dielectric-derived water volume of the earth formation from the dielectric **permittivity** measurement;
acquiring a suite of nuclear magnetic resonance measurements of the earth formation;
deriving a water volume of the earth formation and an apparent heavy oil volume of the earth formation from the nuclear magnetic resonance measurements; and
comparing the dielectric-derived water volume with the nuclear magnetic resonance derived water volume and the apparent oil volume to produce a true heavy oil volume of the earth formation. ---

N) Replace the originally filed specification of August 9th 2002 with the following Replacement Specification Disclosure and Abstract, which provides a clear, clean listing of the originally filed equations & has been approved for entry by the examiner.

The following is an examiner's statement of **Reasons for Allowance**:

11. With respect to **Examiner amended after-final Independent claims 1, 14, 28, and 32**, these **Examiner amended after-final Independent claims** are considered to be allowable over the prior art of record because the prior art of record does not disclose or suggest an MRI method for making formation evaluation determinations where individually distinct acquisitions of dielectric permittivity measurements and individually distinct acquisitions of nuclear magnetic resonance measurements are combined (i.e. **claims 1, 14, 28**) and/or compared (i.e. **claim 32**) in order to determine: the oil volume fraction (i.e. **claim 1**), linear equations to determine fractional fluid volumes (i.e. **claim 14**), a rock-matrix travel time of the earth formation (i.e. **claim 28**), or to derive a water volume and a apparent heavy oil volume from the dielectric permittivity and NMR measurements in order to compare the dielectric permittivity and NMR measurements in order to produce a true heavy oil volume of the earth formation (i.e. **claim 32**) **in combination with each of the remaining limitations and features of each of the claims**. It is the combination of all of the claim limitations, within each **after-final examiner amended independent claim**, taken as a whole that constitutes both the novelty and non-obviousness of applicant's **after-final examiner amended independent claims**.
12. With respect to **Examiner amended after-final dependent claims 2-4 6-13, 15-24, and 29**, each of these **Examiner amended after-final dependent claims** are considered to be allowable over the prior art of record because they each depend from an allowable **after-final examiner amended independent claim**.
13. With respect to **Claim 13**, the prior art of record fails to teach the combinational limitation of "calculating a **salinity of a brine** in the sample based on a total volume of the formation fluids and a known aqueous phase attenuation function ***with respect to the salinity and a fluid temperature***".
14. With respect to **Claim 9**, the prior art of record fails to teach and suggest all the features of **claim 9**, because **claim 9** also requires the **salinity calculation specified** by objected to **claim 13**.

15. With respect to **Claim 15**, the prior art of record fails to teach and suggest the entire combination that "the reservoir fluid model comprises a representation of a non-gas bearing formation, the fractional fluid volumes comprise a water volume fraction, an oil volume fraction, and an oil-based mud filtrate volume fraction, and the set of linear response equations comprises: a nuclear magnetic resonance response equation that defines a total volume of the formation fluids with respect to the oil volume fraction, the water volume fraction, and the oil-based mud filtrate volume fraction; *a dielectric response equation that defines an electromagnetic wave travel time with respect to the oil volume fraction and oil travel time, the water volume fraction and a water travel time, and the oil-based mud filtrate volume fraction and an oil-based mud filtrate travel time;* and a density response equation that defines the bulk density with respect to an oil density and the oil volume fraction, a water density and the water volume fraction, and an oil-based mud filtrate density and the oil-based mud filtrate volume fraction.

16. With respect to **Examiner Amended Claim 22**, the prior art of record fails to teach and suggest the entire combination that "the reservoir fluid model comprises a representation of a gas-bearing formation, the fractional fluid volumes comprise a gas volume fraction, a water volume fraction, and a gas-corrected total volume, and the set of linear response equations comprises: a nuclear magnetic resonance response equation that defines a total volume of formation fluids with respect to the gas volume fraction, a water volume fraction, and a gas-corrected total volume; *a dielectric response equation that is adapted for the gas-bearing formation by defining an electromagnetic wave travel time with respect to the gas volume fraction and a gas travel time, the water volume fraction and a water travel time, and the gas-corrected total volume and a gas-corrected travel time;* and a density response equation that is adapted for the gas-bearing formation by defining the bulk density measurement with respect to the gas volume fraction and a gas density, the water volume fraction and a water density, and the gas-corrected total volume and a gas-corrected total density.

17. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably

accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Examiner's Comment

Information Disclosure Statement

18. The information disclosure statement (IDS) submitted on 05/31/2005 is in compliance with the provisions of 37 CFR 1.97. Accordingly, the examiner has already considered the information disclosure statement. The initialed and dated IDS was attached to the last office action of December 21st 2005.

19. The examiner notes that the "...microwave dielectric constant ..." article submitted with the IDS of 5/31/2005 **has not been considered** on the merits because the reference is incomplete. There is missing text from the top/bottom of some of the textual columns / tables. There are places of blurry and illegible text. The reference has been placed in the file but not treated on the merits, because the reference is incomplete.

Claim Objections

20. The objections to **Claims 6, 7, and 10** from the final office action of December 21st 2006 are rescinded in view of applicant's amendments, in the after-final amendment submission of February 14th 2006.

Canceled Claims

21. **Claims 5, 25, 26, and 27** are canceled as per applicant's August 22nd 2005 amendment and response.

22. **Claims 30, and 31** are canceled as per the Examiner's amendment above as being drawn to a withdrawn and non-elected invention, as a result of the February 28th 2006 telephonic election by applicant.

Response To Arguments

23. Applicant's After-final arguments on pages 9 through 12 of the February 14th 2006 after-final response, have been fully considered but they are not persuasive, by themselves because although applicant's arguments clarify that dielectric permittivity is equivalent to expressing the complex dielectric constant, applicant's claims fail to specify the dielectric permittivity, or equivalently, the complex dielectric constant, as the

dielectric measurement set forth in the after-final claims of February 14th 2006. The examiner notes that because applicant has the complex dielectric constant disclosed in the original specification in the second full paragraph of the detailed description. That the addition to the specification of the sentence **"Therefore, the measurements of travel times and attenuations are equivalent to measuring the complex dielectric constant or permittivity of the earth formation."**, in the Replacement specification, is free of new matter, since the newly added sentence clarifies the equivalency of the originally disclosed subject matter, within the examiner amended after-final pending claims above. The examiner notes that the Replacement specification also corrects the font size of applicant's originally filed equations; in order to make all of the equations completely legible is not new matter. The insertion of the additional sentence above, also supports applicant's argued position in the February 14th 2006 after-final amendment and response that resistivity measurements, which applicant's representative, as noted in the after-final remarks of February 14th 2006 response, mistakenly identified as a dielectric measurement are in fact intrinsically different from dielectric measurements. Additionally applicant's remarks note that NMR measurements, which use radio-frequency electromagnetic radiation, are entirely separate and also intrinsically different from dielectric measurements which use microwave radiation, or electromagnetic radiation which is of a higher frequency than that of the radio-wavelength band of the electromagnetic spectrum.

24. The addition of the word **"permittivity"** is not new matter because **dielectric 'permittivity' is, equivalent to the "complex dielectric constant" terminology, which is originally disclosed by applicant.** The use of the dielectric "permittivity" term has been provided to clear up the confusion that has ensued during the prosecution of the instant application, because initially applicant's representative had incorrectly argued that resistivity was a type of dielectric measurement within the scope of the invention, but as noted in the February 14th 2006 after-final response applicant's representative had failed to "appreciate the difference between a resistivity measurement and a dielectric measurement" [See the February 14th 2006 after-final amendment remarks page 9 paragraph 2]. As a way of resolving the confusion, and

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properly clarifying the scope of the originally disclosed "complex dielectric constant measurement" terminology, the correct, art established terminology of dielectric 'permittivity", which is equivalent to the "complex dielectric constant" terminology has been added by the after-final examiner's amendment to each of the independent claims.

25. In view of the Examiner's After-final amendments to the claims above, all of the prior-art rejections of the December 21st 2005 office action are rescinded, because none of the prior arts of record. Acquire a dielectric permittivity, or complex dielectric constant measurement as set forth in the examiner-amended after-final claims above, or as argued in the after-final response of February 14th 2006, with respect to the proper definition of a dielectric measurement, based on the dielectric 'permittivity", or "complex dielectric constant" equivalent terminology.

Drawings

26. A New set of corrected drawings are required in this application because the official draftsman has objected to the drawings submitted **August 9th 2002** A **complete set of NEW FORMAL DRAWINGS** are now required. [See the attached PTO 948 form of the Official Draftsman's Review.]

27. Applicant is advised to employ the services of a competent patent draftsman outside the Office, as the U.S. Patent and Trademark Office no longer prepares new drawings. The corrected drawings are required in reply to the Office action to avoid abandonment of the application. The requirement for corrected drawings will not be held in abeyance.

Prior Art of Record

28. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

A) **Georgi et al.**, US patent application Publication 2004/0055475 A1 published March 25th 2004, filed April 1st 2003; with a US priority date from provisional application 60/369,268 of April 2nd 2002.

B) **Lew et al.**, US patent 4,785,245 issued November 15th 1988.

C) **Schoen et al.**, US patent 6,686,736 B2 issued February 3rd 2004, filed August 13th 2001 with an effective US provisional priority date of August 30th 2000.

D) **Freedman et al.**, US patent 6,032,101 issued February 29th 2000.


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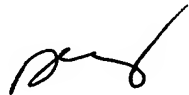
Conclusion

29. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tiffany Fetzner whose telephone number is: (571) 272-2241. The examiner can normally be reached on Monday-Thursday from 7:00am to 4:30pm., and on alternate Friday's from 7:00am to 3:30pm.

30. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diego Gutierrez, can be reached at (571) 272-2245. The **only official fax phone number** for the organization where this application or proceeding is assigned is **(571) 273-8300**.

31. Information regarding the status of an application may be obtained from the Patent Application information Retrieval (PAIR) system Status information for published applications may be obtained from either Private PMR or Public PMR. Status information for unpublished applications is available through Private PMR only. For more information about the PMR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PMR system contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


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